WEST Search History

Hide Items | Restore | Clear | Cancel

DATE: Wednesday, February 11, 2004

Hide?	Set Name	Query	Hit Count
		DB=PGPB,USPT; PLUR=YES; OP=ADJ	
□	L16	L15 and (edge near8 node)	7
□	L15	20010515	47
□	L14	large near8 (data or file or payload) near8 (block or partition or partitioned) near8 (distribute or distributed or distributing or distribution)	75
□	L13	l3 and ((node near8 tree) and (download or downloading))	7
□	L12	l10 and ((rolled adj2 up) near8 attribute)	0
□	L11	l3 and (download or downloading) and node	36
□	L10	l3 and (download or downloading) and node	36
□	L9	L8 and l3	0
□	L8	20010515	6
□	L7	(content or file or payload) near8 (download or downloading) near8 tree	21
□	L6	20010515	0
□	L5	L4 and l3	0
□	L4	(manage or managing or management) near8 large near8 (file or payload or content) near8 intelligent	8
□	L3	20010515	317
□	L2	(distribute or distributing or distribution or delivering or deliver) near8 large near8 (file or payload or content)	587
□	L1	(distribute or distributing or delivering or deliver) near8 large near8 (file of payload)	0

END OF SEARCH HISTORY

WEST Search History

Hide Items | Restore | Clear | Cancel

DATE: Wednesday, February 11, 2004

Hide?	Set Name	Query	Hit Count
		DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; PLUR=YES; OP=ADJ	
□	L17	L16 NOT l5	9
□	L16	20010515	9
□	L15	20010515	0
□	L14	L13 and l12	8
□	L13	(recall or recalling or download or downloading) near8 (portion or part)	4278
□	L12	(divide or dividing or partition or partitioning) near8 large near8 (file or payload or multimedia or data) near8 (distribute or distributing or distribution)	18
□	L11	L10 NOT l5	11
□	L10	L8 and ((download or downloading) near8 (content or file or portion or block))	11
□	L9	L8 and (virtual adj3 tree)	0
□	L8	L7 NOT l5	67
□	L7	20010515	67
□	L6	20010515	0
□	L5	L4 and l3	7
□	L4	node near8 network near8 (adapt or adaptation or adapting or initialize or initializing or initialization)	807
□	L3	L2 and l1	125
□	L2	large near8 (file or data or payload) near8 (delivery or distribution)	1232
□	L1	(manage or managing or management) near8 (content or file or data or payload) near8 (distributed or distributing or distribution)	5551

END OF SEARCH HISTORY

First Hit · Fwd Refs

□ Generate Collection

L17: Entry 1 of 9 File: USPT Sep 17, 2002

DOCUMENT-IDENTIFIER: US 6453314 B1
TITLE: System and method for selective incremental deferred constraint processing after bulk loading data

Application Filing Date (1):
19990730

Detailed Description Text (63):
In a parallel multi-node data processing system, a database management system operating in the data processing system can efficiently handle large amounts of data by partitioning the database into a number of database partitions and distributing the database partitioning across the nodes of the data processing system.

First Hit Fwd Refs

□ Generate Collection

L11: Entry 7 of 11 File: USPT Aug 7, 2001

DOCUMENT-IDENTIFIER: US 6272536 B1
TITLE: System and method for the distribution of code and data

Application Filing Date (1):
19990113

Brief Summary Text (16):
In summary, the invention consists of a system and method for the large scale distribution of application code and data. The system consists of a client-side component, which the user uses to download applications, as well as a server-side component, which is used by a content provider or developer to make applications available for distribution.

Other Reference Publication (16):
Bennett, J.M. and Bauer, Michael A., "An Analysis of Replication Strategies for X.500-like Distributed Directories," Proceedings, Workshop On the Management of Replicated Data, Nov. 8-9, 1990, pp 137-42 IEEE Comput. Soc. Press Los Alamitos, CA.

Other Reference Publication (71):
Colton, Malcom, "Replicated Data in a Distributed Environment," Proc. Of the 1993 ACM SIGMOD International Conference on Management of Data, vol. 22, Issue 2, May, 1993, pp. 464-466, ACM Press, Washington, D.C., USA.

Other Reference Publication (95):
Wedde, Horst F. et al, Distributed Management of Replicated and Partitioned Files Under Dragon Slayer, Conference Publication: Compsac90, The Fourteenth Annual International Computer Software and Applications Conference, Oct. 1990, pp. 436-441, Institute of Electrical and Electronics Engineers, Inc., New York, New York, USA.

First Hit

□ Generate Collection

L10: Entry 7 of 36 File: PGPB Jun 20, 2002

DOCUMENT-IDENTIFIER: US 20020078461 A1
TITLE: Incasting for downloading files on distributed networks

Application Filing Date:
20001214

Summary of Invention Paragraph:
[0007] U.S. Pat. No. 5,926,101 teaches a multi-hop broadcast network of nodes which have a minimum of hardware resources, such as memory and processing power. The network is configured by gathering information concerning which nodes can communicate with each other using flooding with hop counts and parent routing protocols. A partitioned spanning tree is created and node addresses are assigned so that the address of a child node includes as its most significant bits the address of its parent. This allows the address of the node to be used to determine if the node is to process or resend the packet so that the node can make complete packet routing decisions using only its own address.

Summary of Invention Paragraph:
[0010] U.S. Pat. No. 5,802,301 teaches a method for improving load balancing in a file server. The method includes the steps of determining the existence of an overload condition on a storage device having a plurality of retrieval streams, accessing at least one file thereon, selecting a first retrieval stream reading a file, replicating a portion of the file being read by the first retrieval stream onto a second storage device and reading the replicated portion of the file on the second storage device with a retrieval stream capable of accessing the replicated portion of the file. The method enables the dynamic replication of data objects to respond to fluctuating user demand. The method is particularly useful in file servers such as multimedia servers delivering continuously in real time large multimedia files such as movies.

Summary of Invention Paragraph:
[0014] The most frequent use of such a network is for downloading purposes. A client looks up the content list, and wants to download a particular file/content from the network. The existing protocols for this process are extremely simple and can be described in general as follows. The client or a central server searches the list of servers that contain the desired file, and picks one such server (either randomly or according to some priority list maintained by the central server) and establishes a direct connection between the client requesting the down load and the chosen server. This connection is maintained until the entire file has been transferred. The exact implementation might vary from one protocol to another; however, the fact that only one server is picked for the transfer of the entire requested file remains invariant.

Summary of Invention Paragraph:
[0015] The above-mentioned existing protocols suffer from several serious drawbacks, as stated next. Since only one server is picked for the transfer of the entire file (even though there are potentially many servers with the same content), the quality of service becomes totally dependent on the bandwidth and the reliability of the Internet access that the chosen server maintains during the transfer. This poses a serious problem, especially in the case of networks that

primarily comprise of low-performance servers as is the case for Napster and other proposed peer-to-peer networks and the reliability and speed of the host computers cannot be guaranteed. The average available bandwidth could be as low as that of a 28.8K or a 56K modem. Moreover, the connection of the server to the Internet could be dropped in the middle of a download, necessitating another attempt from the beginning. For example, an average MP3 file is around 5 Mega-bytes in length, and it will take around 16-20 minutes to download it over a 56K modem!! If the connection is dropped at any time during this period, then one needs to attempt the download all over again. The issue of choosing the best server among those that have a copy of the requested file is not properly addressed, leading to a further loss in the quality of the service. If the winner is picked randomly then clearly it is not the best choice. Even if the winner is picked based on a pre-sorted list, where servers are ranked according to their average available bandwidth, the resulting scheme would be far from optimal. In particular, even if a server has a higher average bandwidth, since it comprises only a part of the host computer and shares the bandwidth with other competing tasks, the available bandwidth for the download could be drastically low during the time of the transfer. The protocols do not take advantage of the fact that the client could have a much higher available bandwidth than any of the potential servers. For example, even if the client is connected to a high-speed Ethernet, the effective transfer rate for the session could still be as low as that of a modem that the chosen server might be using. Accuracy and integrity of the downloaded file are not usually guaranteed. Since multiple copies of the files are maintained by different servers the issue of the integrity of the downloaded files becomes a serious concern.

Detail Description Paragraph:
[0030] Referring to FIG. 4 a distributed network 110 includes a plurality of hosts 111 and a shared communication channel 112. Each host is coupled to the shared communication channel 112. Each host 111 may act as both a client and a server and uses the distributed network 110, but not all of the hosts need to act as either a client or a server. The downloading process may be called incasting because it can be construed as a reverse of broadcasting. In broadcasting, a file 120 is transmitted to multiple locations generating multiple copies of the file 120. In contrast, in incasting fragments 121 of multiple copies of the file 120 are gathered together to generate a single copy of the file 120. There is a format for creating and storing multiple copies of the files 120 and a protocol to guarantee fast in the sense that it utilizes the maximum available bandwidth for the task and accurate transfer of the requested content/file 120 to a client in the sense that the content of the copied file 120 is the same as that of the stored one. Incasting would constitute the backbone of the distributed network 110.

Detail Description Paragraph:
[0034] The incasting process will work for any existing format for storing files 120 which follows the convention of being byte aligned. Hence, any server can handle a request, where it is asked to transmit blocks of bytes along with start and end indices. For example, a typical request could be for the transmission of M bytes of a file 120 starting at the kth byte. However, for guaranteeing the integrity of the files 120 and for avoiding expensive retransmissions of potentially erroneous downloads, the following format for storing files 120 and partitioning the file 120 into a specified number of segments 121 is recommended. For each segment 121, compute a message digest of the contents using a secure hash function. The message digest basically acts as a unique identifier for the contents of the segment 121 and on reception, can be used to guarantee the integrity of the contents of the segment 121. In order to guarantee authenticity (e.g., the fact that the file 120 was indeed created by the owner), one can in addition sign the digest. Thus, if one has the segment 121, the message digest and the digital signature of the file 120, then one can verify authenticity (check that the signature matches the digest) and then check for integrity (i.e., the digest matches the contents of the segment 21). For example, the Secure Hash Standard (SHS) can be used to generate 160-bit message digests for the segments 121. The

First Hit

□ Generate Collection

L10: Entry 2 of 36 File: PGPB Sep 5, 2002

DOCUMENT-IDENTIFIER: US 20020124098 A1
TITLE: Streaming media subscription mechanism for a content delivery network

Abstract Paragraph:

A reflector network is used within a content delivery network to enable requesting end users to subscribe to live streams that have been published to CDN entry points. A reflector is a generalized packet router program. The reflector network preferably comprises a hierarchy of reflectors that are located at the various entry points into the CDN, at each edge node at which requesting users may be directed by the CDN to obtain live streams, and at various "reflector" nodes located within at least one intermediate layer (in the hierarchy) between the entry points and the edge nodes. The edge nodes and each reflector node also include a manager program that arranges for feeds. When an end user is directed to an edge node that is not yet receiving the desired stream, the edge node's manager issues a subscription request to a set of reflector nodes. If the reflector node(s) are already receiving the desired stream, their reflector(s) begin sending it to the requesting edge node. If, however, the reflector node(s) are not already receiving the desired stream, their manager programs issue the subscription request to the entry point(s) to start the feed.

Application Filing Date:
20010103

Summary of Invention Paragraph:

[0005] Streaming media is a type of Internet content that has the important characteristic of being able to be played while still in the process of being downloaded. A client can play the first packet of the stream, and decompress the second, while receiving the third. Thus, an end user can start enjoying the multimedia without waiting to the end of transmission. Streaming is very useful for delivering media because media files tend to be large particularly as the duration of the programming increases. Indeed, for live events, the file size is, in effect, infinite. To view a media file that is not streamed, users must first download the file to a local hard disk-which may take minutes or even hours-and then open the file with player software that is compatible with the file format. To view streaming media, the user's browser opens player software, which buffers the file for a few seconds and then plays the file while simultaneously downloading it. Unlike software downloads, streaming media files are not stored locally on a user's hard disk. Once the bits representing content are used, the player typically discards them.

Summary of Invention Paragraph:

[0009] is well-known to deliver streaming media using a content delivery network (CDN). A CDN is a self-organizing network of geographically distributed content delivery nodes that are arranged for efficient delivery of digital content (e.g., Web content, streaming media and applications) on behalf of third party content providers. A request from a requesting end user for given content is directed to a "best" replica, where "best" usually means that the item is served to the client quickly compared to the time it would take to fetch it from the content provider origin server.

Summary of Invention Paragraph:
[0013] A reflector network is used in conjunction with a content delivery network (CDN) to enable requesting end users to subscribe to live streams that have been published to CDN entry points. A reflector is a generalized packet router program. The reflector network preferably comprises a hierarchy of reflectors: at least one reflector located at each entry point to the CDN, at each edge node at which requesting users may be directed by the CDN to obtain live streams, and at various "reflector" nodes located within at least one intermediate layer (in the hierarchy) between the entry points and the edge nodes. The intermediate layer is useful to facilitate delivery of streams for which there is high demand. The edge nodes and each reflector node also include a manager program that arranges for feeds. When an end user is directed to an edge node that is not yet receiving the desired stream, the edge node's manager issues a subscription request to a set of reflector nodes. If the reflector node(s) are already receiving the desired stream, their reflector (s) begin sending it to the requesting edge node. If, however, the reflector node (s) are not already receiving the desired stream, their manager programs issue the subscription request up the hierarchy, ultimately reaching the entry point(s) to start the feed.

Brief Description of Drawings Paragraph:
[0018] FIG. 4 is a flowchart illustrating an operation of the inventive subscription mechanism at the edge node to which a requesting end user has been directed by the CDN;

Brief Description of Drawings Paragraph:
[0019] FIG. 5 is a flowchart illustrating an operation of the subscription mechanism at a set reflector node according to the present invention;

Detail Description Paragraph:
[0025] As described in copending application Ser. No. 09/478,571, which is also incorporated herein by reference, live streaming can be further enhanced by having the CDN send multiple copies of the same stream over different routes from a CDN entry point to the optimal streaming server at the edge of the Internet. These copies are then combined to form one complete, original-quality stream, which is sent from the streaming server to the end users. FIG. 2 illustrates this process in more detail. A broadcast stream 200 is sent to a CDN entry point 202. An entry point, for example, comprises two servers (for redundancy), and each server can handle many streams from multiple content providers. Once the entry point receives the stream, it rebroadcasts copies of the stream to set reflectors 204a-n. The streams are multiplexed and delivered to the set reflectors preferably via UDP (e.g., WMT encapsulated in RTSP encapsulated in UDP over IP). These set reflectors are preferably diverse from a network and geographic standpoint (e.g., at diverse Internet backbone data centers) to ensure fault tolerance. Each set reflector, in turn, rebroadcasts its copy of the stream to each subscribing region, e.g., region 206d, of a set of regions 206a-n. A subscribing region 206d is a CDN region that contains one or more streaming edge nodes 208a-n to which user(s) have been routed by the CDN request-routing mechanism. In other words, set reflectors send their streams to every edge region where they are needed. A CDN region, in this example, includes a set of edge nodes connected by a common backbone 209, e.g., a local area network (LAN). Typically, an edge node, e.g., node 208d, comprises a streaming server 212 and it may include a cache 210. A representative server runs an Intel processor, the Linux operating system and a Real Media or QuickTime Server. For Windows-based platforms, a representative server runs an Intel processor, Windows NT or 2000, and a Windows Media Server. As will be described, the edge node also runs control programs 214 to facilitate the inventive subscription mechanism.

Detail Description Paragraph:
[0026] Each subscribing region, then, simultaneously receives multiple copies of the streamed content. These copies have been sent via separate routes over the Internet, so congestion resulting in dropped packets is unlikely to impact each

First Hit

□ Generate Collection

L10: Entry 6 of 36 File: PGPB Jun 27, 2002

DOCUMENT-IDENTIFIER: US 20020083148 A1
TITLE: System and method for sender initiated caching of personalized content

Application Filing Date:
20001221

Detail Description Paragraph:
[0017] FIG. 1 is a schematic diagram of a preferred embodiment network 10 for sender initiated caching of content. As shown network 10 preferably comprises a core network 16. The core network 16 is the backbone network and preferably comprises one or more routers 18 for routing data packets between Service Providers, for example Internet Service Providers (ISPs) 20, and content provider server 12. One or more users 40 access information utilizing one or more access modes, such as access over copper lines 30, cable access 32, access over optical lines 36, broadband wireless access 34, xDSL access 38 and/or the like. These access modes are preferably broadband access modes which have the ability to deliver large volumes of digital content to the user. Users 40 can access one or more central offices, local exchange, or access nodes 24 utilizing one or more of the above mentioned access modes. In the preferred embodiment, each central office 24 has an associated cache 22 for storing content. In the preferred embodiment, the content stored at cache 22 is personalized broadband content. Central office 24 is communicatively connected to ISP 20 which communicates with one or more routers 18. One or more content provider servers 12 communicate with one or more ISPs 14. ISP 14 communicates with one or more routers 18 of the core network 16. One or more aggregation modules 26 may be utilized to seamlessly aggregate the various access modes for providing access to the central office 24 especially for users utilizing different types of access nodes. ISP 14 provides content from content provider server 12 to core network 16.

Detail Description Paragraph:
[0030] Referring now to FIG. 7, which shows a simplified flowchart of an embodiment of a dynamic web caching on-line session 190 according to the teachings of the present invention. The users each first downloads the online session software application from either edge cache engine 146 or game servers 140 and 134, as shown in block 192. The terms online media session or gaming session are herein defined as any online interactive communication session over a computer network in which one or more users enters input based on displayed content, and content is in turn displayed based on user input. One of the users then launches the game server and invites other users using protocols such as SIP (Session Initiation Protocol) and on-demand multicasting, as shown in blocks 194 and 196. For example, as part of the initiation process the user sends an SIP INVITE with SDP (Session Description Protocol) for exchanging user capability, which includes codes for audio and video UDP ports for voice, video and gaming control messages, as well as for exchanging user profile, which includes information about the user's game personality, tendencies, preferences, etc. The user's profile can be obtained by using user questionnaires or by interactively studying the user's inputs or interaction in response to certain gaming situations. The gaming engine may include a behavior monitor (not shown), which monitors the end user's behavior or activities during a communication or gaming session. The behavior monitor may detect and record how the user plays or behaves in an interactive communication session or game, such as the

user's movement input, type of weapon, hand-and-eye coordination, aiming accuracy, reaction time, skill level, aggressiveness, etc.

First Hit

□ Generate Collection

L10: Entry 11 of 36 File: PGPB Jan 24, 2002

DOCUMENT-IDENTIFIER: US 20020010798 A1
TITLE: Differentiated content and application delivery via internet

Application Filing Date:
20010216

Summary of Invention Paragraph:
[0016] It is often the case that the content delivery and distribution provider has a large number of geographically dispersed content delivery and distribution servers. It could manage to forward the requests to the content delivery and distribution servers, using some form of location based resolution of DNS names to IP addresses, based on the origin of the request. Assuming that the content delivery and distribution servers have the desired content cached or mirrored, are relatively near the client, and are not overloaded, then these objects can be served quickly and transparently. This reduces significantly the latency for content arrival, a critical objective in today's web. It should be noted that in this arrangement, the content providers, which control the origin servers, need know nothing about the distribution policy of the content delivery and distribution provider.

Summary of Invention Paragraph:
[0056] 9. Different site views. This important service allows for different views of a site to different customers. Specifically, when an edge server is located within a possibly secured private client domain, such as an intranet, it can be used as a differentiation mechanism that provides special services for a particular class of clients. Such services may not be provided to clients who are outside the class and who access the origin site directly or who access a shared edge server. This form of service differentiation is particularly useful in business-to-business (B2B) applications, e.g., clients of a market research company, CAD system providers or a large wholesale vendor. This service enables different views of the content at different edge server locations and provides special regional and local services and privileges. Such services are enabled for a particular edge server by the downloading of CDML instruction and data structures from the origin site, the target site or a third party site, and by interpretation of CDML code and data structure within the content. Other features of this service include the following:

Summary of Invention Paragraph:
[0066] 12. Origin site load balancing. In some preferred embodiments the edge server may direct user requests to or download content from unloaded origin or relatively close servers. The edge server may maintain a profile of servers load and network condition by measuring rates and latencies experienced with a set of remote origin servers. Using such an approach, the best origin servers in terms of network distance and loading combination may be selected.

Summary of Invention Paragraph:
[0072] The invention provides a content and application delivery system comprising an origin web site which has an origin web server having a first memory for storing a first version of web content. The system includes an edge server communicating via a data network with the origin web server and with a policy control server. The

edge server has a second memory for storing a second version of the web content and deriving the second version from the origin web server according to directives of a service policy that resides at the policy control server. The edge server downloads the directives of the service policy from the policy control server via the data network. A request of a user directed to the origin web site for a resource from the web content is redirected to the edge server, and responsive to the request a third version of the web content is provided to the user from the edge server. the third version is derived from the second version in accordance with the directives of the service policy.

Summary of Invention Paragraph:
[0125] Another aspect of the invention includes the steps of compressing the first version, downloading the first version from the first server to the second server, uncompressing the first version in the second server, and deriving the second version from the first version in the second server.

Detail Description Paragraph:
[0173] In some preferred embodiments regional servers are assigned to group domain names, using a naming convention such as znn-regionalX, where X again represents some number, by causing the regional server to download membership instructions from the origin server or farm in a manner which is disclosed hereinbelow. Such instructions or configuration files for edge server grouping are managed within the znn.com domain. The regional servers at each region then apply these mappings using a local DNS insertion mechanism.

Detail Description Paragraph:
[0195] In addition to the built-in policies, CDML enables a fully programmable interface through the scripting language, CDSL, that can be used to ship policies, such as the one indicated in the above code fragment, as attribute values attached to nodes.

Detail Description Paragraph:
[0196] CDML is based on Extended Markup Language (XML), i.e., it defines an XML document type definition (DTD), and therefore validity of the document can readily be tested using a standard XML parser. The editor is also syntax-directed, taking advantage of XML. In order to provide flexibility in expressing differentiation while still complying with the DTD, CDML allows any nesting of characteristics to take place. For example, a given URL may be associated with a policy that states that certain regions should download a given URL only after five o'clock p.m. local time. This could be expressed by the following pseudo CDML code:

Detail Description Paragraph:
[0197] In this case time is the major characteristic and location is secondary. An alternative policy could require downloading of a page having a high priority to region A, a page having medium priority to region B, and one having low priority to region C. Here the region is the major characteristic, and content-based differentiation is secondary. Hence, in the XML tree the regional characteristic would contain the temporal characteristic. Finally, CDSL, as well as the built-in semantic actions of the CDML interpreter may be based on an extension to the standard XML style sheet language transformations (XSLT), or externally implemented.

Detail Description Paragraph:
[0223] Once defined, edge server profiles are transferred to the edge servers, such as the edge server 84. While the front edge tool 86 logically controls the profiles on the edge server 84, the physical transfer of profiles to the edge server 84 is done through the origin web site 82. The front edge tool 86 stores the profiles on the origin web site 82, and the edge server 84 downloads its profile from the origin web site 82 via standard client-server web protocols using the internet 88. The profile editing service is effectively decoupled from the responsibility for

First Hit

□ Generate Collection

L10: Entry 13 of 36 File: PGPB Jun 14, 2001

DOCUMENT-IDENTIFIER: US 20010003846 A1
TITLE: Encapsulated, streaming media automation and distribution system

Abstract Paragraph:
Disclosed are systems and methods for creating and distributing programming content carried by a digital streaming media to be a plurality of remote nodes located over a large geographic area to create customized broadcast quality programming at the remote nodes. At the remote nodes, a multi-window screen display simultaneously shows different programming including national programming and local programming content. The remote nodes utilize a remote channel origination device to assemble the customized programming at the remote location that can be controlled from a central location. An encapsulated IP and IP encryption system is used to transport the digital streaming media to the appropriate remote nodes. Also disclosed is a graphical user interface ("GUI") providing a software control interface for creating and editing shows or programs that can be aired or played on a remote display device having a multi-window display. The intuitive GUI Software provides the user the ability to easily manage and assemble a series of images, animations and transitions as a single broadcast quality program to be displayed on a remote display device. Another application software system is capable of automating the production of audio narration reports. The disclosed audio concatenation engine automates the creation of audio narration using prerecorded audio segments to minimize the requirement for live, on-air personnel to record audio narration segments.

Application Filing Date:
20001201

Summary of Invention Paragraph:
[0001] This invention relates in general to the automation and distribution of programming information including video, audio, text, and graphics to a large number of program viewers located over a large geographic area. More particularly, it is directed to an integrated, automated production and distribution system for providing customized delivery of digital streaming media to particular geographic areas, markets, groups and/or individuals via remotely controlled origination nodes.

Summary of Invention Paragraph:
[0016] These existing systems address basic requirements such as the ability to reduce the digital bandwidth necessary to carry a video signal of any given quality, the ability to transport these digitally compressed video and audio signals via standard digital transmission and modulation systems whether satellite, fiber, wireless and/or Internet based, and the ability to scramble and control individual authorization of groups and/or specific satellite receivers over a point-to-point and/or multi-point system via the use of key based conditional access and encryption technologies. In most cases, the network and/or regional/sectional programming is distributed from a network headend facility directly to the appropriate redistribution headend. In other words, TV networks are not designed to forward the appropriate program elements both real-time and stored to an automated, remote origination node for customized production, coordination and distribution of broadcast quality localized programming via terrestrial TV,

cable MSO, DTH headend, internet web servers and/or home based processing unit

Summary of Invention Paragraph:
[0020] The exemplary embodiments of the present invention provide an integrated streaming media system capable of generating and distributing broadcast quality streaming media content to a large number of remote nodes located over a large geographic area. In the exemplary embodiments, the network automation and integration may extend beyond the production and generation facilities to extend the capability of centrally scheduled network control to remote locations, if necessary, where programming content can be specifically customized for the particular remote location and/or region. The exemplary embodiments described herein are numerous and have many different aspects and embodiments, any of which may be practiced by alone or in combination with other aspects of the invention.

Summary of Invention Paragraph:
[0021] According to an exemplary embodiment, the streaming media generation and distribution system includes a broadcast or Network Operations Center, a digital distribution system, and Remote Channel Origination Nodes. The Network Operations Center operates 24 hours a day, 7 days a week and houses the broadcast, production, technical and programming operations of the network. From a wide variety of information sources, the Network Operations Center creates the digital streaming media program content carried by a digital streaming media encapsulated by the IP for distribution to the remote nodes over the satellite network. Preferably, the facility will support the acquisition of programming and information to create the live programming for distribution via encapsulated IP transport techniques.

Summary of Invention Paragraph:
[0023] The network operation center preferably includes a Network Automation and Integration subsystem and Network Monitor Distribution and Control subsystem with specialized computer automated and networked components to digitally assemble the programming components to implement the multi-window program display. The Network Automation and Integration preferably manages the "multi-channel" origination to the remote nodes and coordinates with automated production systems to create the different segments for the multi-part screen with the individualized audio narratives. The facility preferably includes multiple production areas to enable the concurrent production of regional and local weather segments. The automated production systems preferably mange the incoming information, such as weather data, and digitally distribute it to the different production areas for reformatting and editing.

Summary of Invention Paragraph:
[0027] These interactive/transactional components are carried and distributed by a digital transmission system utilizing encapsulated IP techniques. This method allows the appropriate interactive applications and data elements to be distributed to a specific, predetermined headend via a specific, predetermined remote node. In this way, an effective overlay, virtual private network ("VPN") is constructed to deliver the appropriate interactive components to the appropriate headend device through a network Remote Channel Origination Node ("RCON") via vendor specified physical interfaces to digital tier, cable headend equipment.

Summary of Invention Paragraph:
[0029] The exemplary network operations center preferably supports and synchronizes local insertion at the remote nodes to offer "local avail" opportunities. For example, the system will be developed to support the delivery of localized weather information with audio and data, where each of the remote nodes receiving specific weather data and commercials. The network will preferably deploy insertion capabilities at the remote nodes to enable insertion of local weather programming in addition to local advertising. Preferably, the insertion capability is controlled from the network operations center using a Graphical User Interface application software to enable an operator to integrate, create, edit and control

First Hit Fwd Refs

□ Generate Collection

L10: Entry 16 of 36 File: USPT Apr 22, 2003

DOCUMENT-IDENTIFIER: US 6553413 B1
TITLE: Content delivery network using edge-of-network servers for providing content delivery to a set of participating content providers

Application Filing Date (1):
20000628

Brief Summary Text (17):
A further feature of the present invention is the ability to distribute and manage content over a large network without disrupting the Content Provider's direct relationship with the end user.

Detailed Description Text (46):
Performance for long downloads can also be improved by dynamically changing the server to which a client is connected based on changing network conditions. This is especially helpful for audio and video downloads (where the connections can be long and where quality is especially important). In such cases, the user can be directed to an alternate server in mid-stream. The control structure for redirecting the client can be similar to that described above, but it can also include software that is placed in the client's browser or media player. The software monitors the performance of the client's connection and perhaps the status of the network as well. If it is deemed that the client's connection can be improved by changing the server, then the system directs the client to a new server for the rest of the connection.

Detailed Description Text (64):
Competing solutions are not scalable to more than a small number of sites. For example, solutions based on mirroring are typically used in connection with at most three or four sites. The barriers to scaling include the expense of replicating the entire site, the cost of replicating computing resources at all nodes, and the complexity of supporting the widely varying software packages that Content Providers use on their servers.

Detailed Description Text (65):
The unique system architecture of the present invention is scaleable to hundreds, thousands or even millions of nodes. Servers in the hosting network can malfunction or crash and the system's overall function is not affected. The global hosting framework makes efficient use of resources; servers and client software do not need to be replicated at every node because only the hosting server runs at each node. In addition, the global hosting server is designed to run on standard simple hardware that is not required to be highly fault tolerant.

Detailed Description Text (86):
Further, as used herein, a Web "client" should be broadly construed to mean any computer or component thereof directly or indirectly connected or connectable in any known or later-developed manner to a computer network, such as the Internet. The term Web "server" should also be broadly construed to mean a computer, computer platform, an adjunct to a computer or platform, or any component thereof. Of course, a "client" should be broadly construed to mean one who requests or gets the file, and "server" is the entity which downloads the file.

First Hit Fwd Refs

□ Generate Collection

L10: Entry 33 of 36 File: USPT May 11, 1999

DOCUMENT-IDENTIFIER: US 5903566 A
TITLE: Method for distributing program code to intelligent nodes in a wireless mesh data communication network

Abstract Text (1):
A large data file is distributed to a number of nodes in a data communication network by a process of distributed downloading. Destination nodes are informed of the location in the network of the large data file and are directed to receive the large data file by requesting that blocks of data containing the file be transmitted to them from the designated source node. The destination nodes control the file transfer. The large data file may contain program code for updating network software.

Application Filing Date (1):
19940624

Brief Summary Text (3):
Packet communication is a form of data communication whereby segments or packets of data are routed with error checking and confirmation of receipt. Packets may be transmitted directly between a source node and a destination node or may be relayed via a number of relay nodes. Several methods of data packet routing are known.

Brief Summary Text (4):
Some methods of packet communication are directory-based routing and non-directory-based routing. According to directory-based routing method, the address in the header of a packet is used as an index to a directory of packet routing lists stored in a source node. The source node must maintain and continuously update a routing list for each node in the network. In non-directory-based routing, the complexities associated with directory-based routing techniques are avoided. There is no need to store connectivity information for each transmitting node in the network, thus reducing the amount of overhead processing that must be done by the network to preserve network connections. However, non-directory-based routing techniques generally do not permit network parameter optimization. A number of patents have issued to the assignees of the present invention concerning various aspects of data network operation including U.S. Pat. Nos. 5,079,768; 5,115,433; and 5,007,052.

Brief Summary Text (5):
A common task that must be periodically performed in any network is the updating of network software in each of the physically separate machines that make up the network. The network software resides individually in each physically separate network node and controls how that machine interacts with the network. In general, changing the network software involves installing the new software on all of the machines in the network. This may be done manually by a human operator at each machine but is preferably done over the network in such a way that one node on the network directs the other nodes to accept data transmissions that include the new program code and then directs the nodes to execute the new code.

Brief Summary Text (6):
Typically, the data file that contains the new executable program code is very

large when compared to other files transmitted on the network and may take many minutes to several hours to transmit, even just between two nodes. Updating all the nodes on a network can therefore consume significant network resources, particularly if the program code file is routed independently from the source node to each node in the network.

Brief Summary Text (7):
Two methods known in the art for program downloading are direct transmission and code float.

Brief Summary Text (9):
This method has several drawbacks in practice, especially when utilized in attempting code download to a multitude of nodes in a geographically distributed broadcastless communication environment. First, when a large number of nodes require simultaneous updating, keeping track of the progress of the individual downloads becomes logistically difficult. In addition, the described method requires that the medium over which the download is proceeding be error free. To create an error free connection over any of several unreliable media requires substantial computing resources to be dedicated to the maintenance of each connection. In practice, this limits the number of simultaneous connections (downloads) that can exist. Finally, the path between the code source and the destination node must remain intact throughout the download. This requirement places possibly severe demands on the stability of the network topology; in environments where the network topology is changing rapidly, it may not be possible to maintain a connection for the length of time required for the complete code transfer.

Brief Summary Text (10):
Another method for the transport of executable code is often called the "code float" method. In this method, data packets containing the executable code are "floated" over the network medium to all the nodes in the network. Each node keeps track of the blocks it has received (or those it has not received and thus requires). When it has received and validated all the blocks of code it requires, the node generally sends in a report to the source stating that "it is done downloading." When all the nodes have reported in, the source can stop and free the consumed data bandwidth for other uses.

Brief Summary Text (11):
This method also has several drawbacks in practice that place limits on its effectiveness for download to geographically distinct nodes. First, the method requires that a broadcast medium (or a close approximation) be available for "floating" the code out. In addition, much data is sent out redundantly; the source does not know which blocks are still required by the receiving nodes and thus usually just keeps sending blocks in sequence until all the nodes have reported in as complete (or conversely, have reported in that they still need blocks of code). Finally, code floating by nature is best utilized when all the nodes in a network are homogeneous. It is unsuited for the download of different code bodies, for example in the case where nodes with completely different functionality are required.

Brief Summary Text (12):
What is needed is a method for distributing large files possibly containing executable code to a large number of nodes in a network that does not have the inefficiencies associated with direct transmission or code float.

Brief Summary Text (14):
According to the invention, in a wireless mesh packet communications system wherein a multitude of nodes exist that are not able to cheaply broadcast, executable code download may be accomplished by informing each destination node of the location (also called an address) of a source node and a description of the data file blocks

First Hit Fwd Refs

□ Generate Collection

L10: Entry 34 of 36 File: USPT Jan 5, 1999

DOCUMENT-IDENTIFIER: US 5857072 A
TITLE: System and method for distributing data simultaneously to multiple computers on a network, with advanced notice to intended recipients

Application Filing Date (1):
19960430

Brief Summary Text (9):
Connectionless operations manage user PDUs as independent and separate entities. No relationship is maintained between successive data transfers, and minimal records are maintained concerning the ongoing communications process through the network. In contrast to connection-oriented service, connectionless service provides neither positive acknowledgments nor negative acknowledgments regarding the data transmission. Thus, by its very nature, connectionless service can achieve significant independence from: (a) specific protocols within a subnetwork, (b) subnetworks from each other, and (c) subnetworks from user-specific protocols. Additionally, connectionless networks are not concerned with flow control or any type of resequencing operations at the final destination. Connectionless networks may also allow multiple copies of the same message to arrive via bridges. As noted, each PDU is handled as an independent entity such that data units can take different routes to avoid failed nodes or congestion at a point in the network. However, connectionless protocols do consume more overhead than their connection-oriented counterparts in relation to the length of the headers and in proportion to the amount of user data in the PDU.

Brief Summary Text (11):
A significant limitation of each of the above-referenced file distribution packages relates to the method in which data is distributed. Specifically, in each of these distribution packages, all data is distributed to multiple client computers one at a time. Thus, data sent to one hundred client computers, for example, must be sent one hundred times (once to each computer) and thus takes one hundred times longer than would be required to send the data to one client computer. Consequently, when large numbers of client computers associated with the network require a data distribution, existing file distribution systems require a significant amount of network bandwidth and increased distribution time.

Detailed Description Paragraph Table (1):
______________________________________ Structure for message to ask client for information about its current data files: typedef struct tagSTRUCT.sub.-- WHAT.sub.-- U.sub.-- GOT { CMNG.sub.-- HEADER xHeader; // ucMessageID == MSG.sub.-- WHAT.sub.-- U.sub.-- GOT WORD wNumOfGroups; // max MAX.sub.-- NUM.sub.-- GROUPS WORD wNumOfFileNames; // max MAX.sub.-- NUM.sub.-- DIR.sub.-- ENTRIES GROUP.sub.-- INFO xGroup[MAX.sub.-- NUM.sub.-- GROUPS]; FILE.sub.-- NAME xFileName[MAX.sub.-- NUM.sub.-- DIR.sub.-- ENTRIES]; } STRUCT.sub.-- WHAT.sub.-- U.sub.-- GOT; Structure for message to initiate a file transfer: typedef struct tagSTRUCT.sub.-- FILE.sub.-- HEADER { CMNG.sub.-- HEADER xHeader; // ucMessageID == MSG.sub.-- FILE.sub.-- HEADER WORD wNumOfGroups; // max MAX.sub.-- NUM.sub.-- GROUPS WORD wNumofRecords; // change to 32-bit if needed GROUP.sub.-- INFO xGroup[MAX.sub.-- NUM.sub.-- GROUPS]; FILE.sub.-- NAME xFileName; FILE.sub.-- INFO xFileInfo; DWORD dwActivationTime; } STRUCT.sub.-- FILE HEADER; Structure for message to send

partial data for a data transfer: typedef struct tagSTRUCT.sub.-- FILE.sub.-- RECORD { CMNG.sub.-- HEADER xHeader; // ucMessageID == MSG.sub.-- FILE.sub.-- RECORD long int lRecNum; // -1 to indicate download aborted FILE.sub.-- DATA xFileData; } STRUCT.sub.-- FILE.sub.-- RECORD;

First Hit

□ Generate Collection

L5: Entry 1 of 7 File: PGPB Mar 6, 2003

DOCUMENT-IDENTIFIER: US 20030046369 A1
TITLE: Method and apparatus for initializing a new node in a network

Abstract Paragraph:
Large payload files are selectively partitioned in blocks and the blocks distributed to a plurality of distribution stations at the edge of the network qualified to have the data. Each qualified station decides how much and what portion of the content to save locally, based on information such as network location and environment, usage, popularity, and other distribution criteria defined by the content provider. Different pieces of a large payload file may be available from different nodes, however, when a user requests access to the large payload file, for example, through an application server, a virtual file control system creates an illusion that the entire file is present at the connected node. However, since only selective portions of the large payload file may actually be resident at that node's storage at the time of request, a cluster of distribution servers at the distribution station may download the non-resident portions of the file as the application server is servicing the user. The download may be in parallel and usually from the least congested nodes. New nodes added to the network learn from other nodes in the network what content they should have and download the required content, in a desired amount, onto their local storage devices from the nearest and least congested nodes without interrupting network operation. Each node manages its local storage and decides what content to prune based on information such as usage patterns.

Cross Reference to Related Applications Paragraph:
[0001] This application is a divisional of U.S. Application No. 09/681,644, filed on May 15, 2001, entitled "Method and Apparatus For Large Payload Distribution in a Network," which claims the benefit of U.S. Provisional Application No. 60/266,286, filed on Oct. 26, 2000, entitled "Large Payload Delivery Networks Having Integrated Content Management Services," the specification of which is herein incorporated by reference.

Summary of Invention Paragraph:
[0005] Network-based content delivery that relies on a single source to simultaneously distribute various types of information to multiple remote locations may, depending on the size of files being transferred, encounter network-loading problems around the server or the server itself may be over tasked. For example, since transferring a small file (e.g., a web-page) usually takes only a few seconds, the massive distribution of a small file from one source to thousands of destination locations may not create large impact on the network traffic near the source. Transferring a large file (i.e., a large payload), in contrast, can take tens of minutes to hours. If the distribution of such payloads relies on a single source, the network performance near the source, and the subsequent delivery of content, could degrade severely and become unacceptable.

Summary of Invention Paragraph:
[0007] The fast-paced expansion of the broadband industry has fueled the push for rich media (e.g., full length movies, video, or other types of multimedia data). Broadband technology brings high-speed connection capabilities for content delivery to remote users hence large payloads can be transferred faster. Also, broadband

technology makes it possible to send audio and/or video data using streaming media whereby the data is sent in streams for real-time playback, for example. Thus, the quality of rich media at the user's terminal, more than that of any other type of information, is now more dependent on the performance capabilities of the delivery technology. In order to minimize delivery delays, network congestion, and other related problems, some systems attempt to locate content on server systems that are located in close proximity to, i.e., a few hubs of connections away from the end-users. These server locations approximately define the concept known as the "edge" of the network. For example, the Internet service providers are in close proximity to the end-user thus may be regarded as being at the edge of the network. When servers are placed in such locations, the servers are said to be at the edge of the network. End-user systems that are configured to obtain content from network nodes located at the edge of the network are therefore beyond the edge of the network (a.k.a. last mile). However, it is important to note that systems located beyond the edge of the network are still coupled to the network and capable of communicating with the server computers located at the edge. Placing content at the edge of the network is advantageous because it can reduce the latency in servicing users located beyond the edge. Current approaches for delivering large payloads to the "edge" consist of mirroring or caching. These approaches and the limitations inherent in each approach will now be discussed in detail so as to give the reader an understanding of the advancements made by the invention.

Summary of Invention Paragraph:
[0035] Therefore, there is a need to address the cost, scalability, and load-balancing issues associated with large payload delivery to the edge of the network. However, before discussing the present invention, a general overview of how files are handled in different operating systems is presented.

Summary of Invention Paragraph:
[0041] An embodiment of the invention provides an improved mechanism for distributing large files throughout a computer network and delivering such files to an end-user system. When the invention is implemented it provides multiple users with a way to obtain access to large payload files without overburdening network resources. If, for example, a user wishes to download a large file such as a video file an embodiment of the invention provides a way to deliver that video file to the requesting user without putting a strain on the network. The system accomplishes this by breaking the large file into multiple portions and storing those portions in locations (e.g., nodes) distributed throughout the network. The portions stored throughout the network are distributed utilizing a flow optimization technique that provides for the intelligent management of large data files. Thus, the portions of large data file are stored in locations that minimize the amount of time it takes to deliver the portion to the end-user system. These locations are referred to by those of ordinary skill in the art as the edge of the network.

Summary of Invention Paragraph:
[0043] In one embodiment of the invention, the system is optimized so that large payload files can be distributed across existing networks (including the Internet and corporate intranets) using a transport layer network overlay to push content to the edge of the network. Specifically, the embodiments of the invention improve large payload delivery performance, scalability, reliability, and availability.

Summary of Invention Paragraph:
[0044] As mentioned above, one embodiment of the invention breaks the large payload files into multiple portions. This may be accomplished by selectively partitioning the large payload file into blocks that are replicated and distributed to a plurality of distribution stations (a.k.a. nodes) at the edge of the network. Each distribution station is configured to determine how much of the content to save locally, based on information such as usage, popularity, etc. The content provider defines what distribution stations are qualified to function as distribution

First Hit

□ Generate Collection

L5: Entry 2 of 7 File: PGPB Feb 13, 2003

DOCUMENT-IDENTIFIER: US 20030031176 A1
TITLE: Method and apparatus for distributing large payload file to a plurality of storage devices in a network

Abstract Paragraph:

Large payload files are selectively partitioned in blocks and the blocks distributed to a plurality of distribution stations at the edge of the network qualified to have the data. Each qualified station decides how much and what portion of the content to save locally, based on information such as network location and environment, usage, popularity, and other distribution criteria defined by the content provider. Different pieces of a large payload file may be available from different nodes, however, when a user requests access to the large payload file, for example, through an application server, a virtual file control system creates an illusion that the entire file is present at the connected node. However, since only selective portions of the large payload file may actually be resident at that node's storage at the time of request, a cluster of distribution servers at the distribution station may download the non-resident portions of the file as the application server is servicing the user. The download may be in parallel and usually from the least congested nodes. New nodes added to the network learn from other nodes in the network what content they should have and download the required content, in a desired amount, onto their local storage devices from the nearest and least congested nodes without interrupting network operation. Each node manages its local storage and decides what content to prune based on information such as usage patterns.

Cross Reference to Related Applications Paragraph:

[0001] This application is a divisional of U.S. application Ser. No. 09/681,644, filed on May 15, 2001, entitled "Method and Apparatus For Large Payload Distribution in a Network," which claims the benefit of U.S. Provisional Application No. 60/266,286, filed on Oct. 26, 2000, entitled "Large Payload Delivery Networks Having Integrated Content Management Services," the specification of which is herein incorporated by reference.

Summary of Invention Paragraph:

[0005] Network-based content delivery that relies on a single source to simultaneously distribute various types of information to multiple remote locations may, depending on the size of files being transferred, encounter network-loading problems around the server or the server itself may be over tasked. For example, since transferring a small file (e.g., a web-page) usually takes only a few seconds, the massive distribution of a small file from one source to thousands of destination locations may not create large impact on the network traffic near the source. Transferring a large file (i.e., a large payload), in contrast, can take tens of minutes to hours. If the distribution of such payloads relies on a single source, the network performance near the source, and the subsequent delivery of content, could degrade severely and become unacceptable.

Summary of Invention Paragraph:

[0007] The fast-paced expansion of the broadband industry has fueled the push for rich media (e.g., full length movies, video, or other types of multimedia data). Broadband technology brings high-speed connection capabilities for content delivery to remote users hence large payloads can be transferred faster. Also, broadband technology makes it possible to send audio and/or video data using streaming media whereby the data is sent in streams for real-time playback, for example. Thus, the quality of rich media at the user's terminal, more than that of any other type of information, is now more dependent on the performance capabilities of the delivery technology. In order to minimize delivery delays, network congestion, and other related problems, some systems attempt to locate content on server systems that are located in close proximity to, i.e., a few hubs of connections away from the end-users. These server locations approximately define the concept known as the "edge" of the network. For example, the Internet service providers are in close proximity to the end-user thus may be regarded as being at the edge of the network. When servers are placed in such locations, the servers are said to be at the edge of the network. End-user systems that are configured to obtain content from network nodes located at the edge of the network are therefore beyond the edge of the network (a.k.a. last mile). However, it is important to note that systems located beyond the edge of the network are still coupled to the network and capable of communicating with the server computers located at the edge. Placing content at the edge of the network is advantageous because it can reduce the latency in servicing users located beyond the edge. Current approaches for delivering large payloads to the "edge" consist of mirroring or caching. These approaches and the limitations inherent in each approach will now be discussed in detail so as to give the reader an understanding of the advancements made by the invention.

Summary of Invention Paragraph:
[0038] Therefore, there is a need to address the cost, scalability, and load-balancing issues associated with large payload delivery to the edge of the network. However, before discussing the present invention, a general overview of how files are handled in different operating systems is presented.

Summary of Invention Paragraph:
[0044] An embodiment of the invention provides an improved mechanism for distributing large files throughout a computer network and delivering such files to an end-user system. When the invention is implemented it provides multiple users with a way to obtain access to large payload files without overburdening network resources. If, for example, a user wishes to download a large file such as a video file an embodiment of the invention provides a way to deliver that video file to the requesting user without putting a strain on the network. The system accomplishes this by breaking the large file into multiple portions and storing those portions in locations (e.g., nodes) distributed throughout the network. The portions stored throughout the network are distributed utilizing a flow optimization technique that provides for the intelligent management of large data files. Thus, the portions of large data file are stored in locations that minimize the amount of time it takes to deliver the portion to the end-user system. These locations are referred to by those of ordinary skill in the art as the edge of the network.

Summary of Invention Paragraph:
[0046] In one embodiment of the invention, the system is optimized so that large payload files can be distributed across existing networks (including the Internet and corporate intranets) using a transport layer network overlay to push content to the edge of the network. Specifically, the embodiments of the invention improve large payload delivery performance, scalability, reliability, and availability.

Summary of Invention Paragraph:
[0047] As mentioned above, one embodiment of the invention breaks the large payload files into multiple portions. This may be accomplished by selectively partitioning the large payload file into blocks that are replicated and distributed to a plurality of distribution stations (a.k.a. nodes) at the edge of the network. Each distribution station is configured to determine how much of the content to save locally, based on information such as usage, popularity, etc. The content provider

First Hit

□ Generate Collection

L5: Entry 3 of 7 File: PGPB Feb 6, 2003

DOCUMENT-IDENTIFIER: US 20030026254 A1
TITLE: Method and apparatus for large payload distribution in a network

Abstract Paragraph:

Large payload files are selectively partitioned in blocks and the blocks distributed to a plurality of distribution stations at the edge of the network qualified to have the data. Each qualified station decides how much and what portion of the content to save locally, based on information such as network location and environment, usage, popularity, and other distribution criteria defined by the content provider. Different pieces of a large payload file may be available from different nodes, however, when a user requests access to the large payload file, for example, through an application server, a virtual file control system creates an illusion that the entire file is present at the connected node. However, since only selective portions of the large payload file may actually be resident at that node's storage at the time of request, a cluster of distribution servers at the distribution station may download the non-resident portions of the file as the application server is servicing the user. The download may be in parallel and usually from the least congested nodes. New nodes added to the network learn from other nodes in the network what content they should have and download the required content, in a desired amount, onto their local storage devices from the nearest and least congested nodes without interrupting network operation. Each node manages its local storage and decides what content to prune based on information such as usage patterns.

Cross Reference to Related Applications Paragraph:
[0001] This application claims the benefit of U.S. Provisional Application No. 60/266,286, filed on Oct. 26, 2000, entitled "Large Payload Delivery Networks Having Integrated Content Management Services," the specification of which is herein incorporated by reference.

Summary of Invention Paragraph:
[0005] Network-based content delivery that relies on a single source to simultaneously distribute various types of information to multiple remote locations may, depending on the size of files being transferred, encounter network-loading problems around the server or the server itself may be over tasked. For example, since transferring a small file (e.g., a web-page) usually takes only a few seconds, the massive distribution of a small file from one source to thousands of destination locations may not create large impact on the network traffic near the source. Transferring a large file (i.e., a large payload), in contrast, can take tens of minutes to hours. If the distribution of such payloads relies on a single source, the network performance near the source, and the subsequent delivery of content, could degrade severely and become unacceptable.

Summary of Invention Paragraph:
[0007] The fast-paced expansion of the broadband industry has fueled the push for rich media (e.g., full length movies, video, or other types of multimedia data). Broadband technology brings high-speed connection capabilities for content delivery to remote users hence large payloads can be transferred faster. Also, broadband technology makes it possible to send audio and/or video data using streaming media whereby the data is sent in streams for real-time playback, for example. Thus, the

quality of rich media at the user's terminal, more than that of any other type of information, is now more dependent on the performance capabilities of the delivery technology. In order to minimize delivery delays, network congestion, and other related problems, some systems attempt to locate content on server systems that are located in close proximity to, i.e., a few hubs of connections away from the end-users. These server locations approximately define the concept known as the "edge" of the network. For example, the Internet service providers are in close proximity to the end-user thus may be regarded as being at the edge of the network. When servers are placed in such locations, the servers are said to be at the edge of the network. End-user systems that are configured to obtain content from network nodes located at the edge of the network are therefore beyond the edge of the network (a.k.a. last mile). However, it is important to note that systems located beyond the edge of the network are still coupled to the network and capable of communicating with the server computers located at the edge. Placing content at the edge of the network is advantageous because it can reduce the latency in servicing users located beyond the edge. Current approaches for delivering large payloads to the "edge" consist of mirroring or caching. These approaches and the limitations inherent in each approach will now be discussed in detail so as to give the reader an understanding of the advancements made by the invention.

Summary of Invention Paragraph:
[0035] Therefore, there is a need to address the cost, scalability, and load-balancing issues associated with large payload delivery to the edge of the network. However, before discussing the present invention, a general overview of how files are handled in different operating systems is presented.

Summary of Invention Paragraph:
[0041] An embodiment of the invention provides an improved mechanism for distributing large files throughout a computer network and delivering such files to an end-user system. When the invention is implemented it provides multiple users with a way to obtain access to large payload files without overburdening network resources. If, for example, a user wishes to download a large file such as a video file an embodiment of the invention provides a way to deliver that video file to the requesting user without putting a strain on the network. The system accomplishes this by breaking the large file into multiple portions and storing those portions in locations (e.g., nodes) distributed throughout the network. The portions stored throughout the network are distributed utilizing a flow optimization technique that provides for the intelligent management of large data files. Thus, the portions of large data file are stored in locations that minimize the amount of time it takes to deliver the portion to the end-user system. These locations are referred to by those of ordinary skill in the art as the edge of the network.

Summary of Invention Paragraph:
[0043] In one embodiment of the invention, the system is optimized so that large payload files can be distributed across existing networks (including the Internet and corporate intranets) using a transport layer network overlay to push content to the edge of the network. Specifically, the embodiments of the invention improve large payload delivery performance, scalability, reliability, and availability.

Summary of Invention Paragraph:
[0044] As mentioned above, one embodiment of the invention breaks the large payload files into multiple portions. This may be accomplished by selectively partitioning the large payload file into blocks that are replicated and distributed to a plurality of distribution stations (a.k.a. nodes) at the edge of the network. Each distribution station is configured to determine how much of the content to save locally, based on information such as usage, popularity, etc. The content provider defines what distribution stations are qualified to function as distribution stations and may also define other distribution criteria. Distribution stations in the network manage storage and transfer content (e.g., portions of large payload

First Hit Fwd Refs

□ Generate Collection

L11: Entry 11 of 11 File: USPT Oct 22, 1996

DOCUMENT-IDENTIFIER: US 5568181 A
TITLE: Multimedia distribution over wide area networks

Application Filing Date (1):
19950501

Brief Summary Text (6):
In accordance with the illustrative embodiment of the present invention, the distribution of video files over large geographical areas makes use of local video caches along with efficient distribution of such video files to the local caches. High speed local area networks are then able to deliver the video files locally from the local cache in real time, while a slower wide area network is able to transfer video files from one, or more centralized video storage libraries to the local caches at the slower, non-real time rates common to such wide area networks. More particularly, user access to video files utilizes one of three different algorithms, depending on the request and the local availability of a file. If the file is already available locally, for example, the user may obtain full access (browsing, playback, rewind and multiple viewing) over local area network facilities such as those currently available today. If a request specifies a future time for access, a remote file can be scheduled for transfer to the local cache at any convenient time or times prior to viewing. Finally, if a request specifies a video file which is not in the local cache, a "preface" of the video file is immediately transferred to the local cache. The preface is a predetermined initial portion of the video file having a playback duration just long enough to balance the time required to transfer the remainder of the video file to the local cache with the time to play back the entire video file. This latter type of file access is called "speed match" playback.

Detailed Description Text (4):
The video distribution management portion of FIG. 1, providing file service functions, is comprised of the video library 11, the wide area server 10, WAN 13 and video distribution management system 12. The video playback portion, providing interactive video access, comprises local area server 14, LAN 16, local area video cache 15 and a plurality of video display stations like station 17. Local area server 14 serves as a rate changing interface between the high speed LAN 16 and the lower speed WAN 13. As will be described hereinafter, video distribution management system (VDMS) 12 receives requests from all of the video display stations, such as station 17, connected to all of the LANs, such as LAN 16, connected to WAN 13, and provides interactive playback of video files by downloading such video files from library 11 to local caches 15 at the transmission rate of WAN 13, and then provides interactive, real time video playback of these same files from local cache 15 to stations 17 over LAN 16.

Detailed Description Text (24):
It can be seen that the processes described in FIGS. 2 through 5 cooperate to provide efficient and economical distribution of video files from a remote video library to a large number of widely distributed video file users, using a wide area network and a plurality of local area networks as the transmission vehicles for such video distribution.

First Hit Fwd Refs

□ Generate Collection

L17: Entry 6 of 9 File: USPT Jul 7, 1998

DOCUMENT-IDENTIFIER: US 5778393 A
**** See image for Certificate of Correction ****
TITLE: Adaptive multitasking for dataset storage

Application Filing Date (1):
19960520

Brief Summary Text (15):
The invention affords a number of distinct advantages. For example, the invention minimizes the processor overhead expended in activating data storage devices since data storage devices are only invoked as needed. Furthermore, the invention reduces the waiting time to store data by dividing excessively large blocks of data and distributing their storage among the data storage devices. The invention is therefore useful, for example, in a recovery system of a data storage system, where data is efficiently stored in a journal volume for later use in recovering a failed primary storage volume.

First Hit

□ Generate Collection

Search Forms
Search Results
Help
User Searches
Preferences
Logout

L10: Entry 1 of 36 File: PGPB Dec 25, 2003

DOCUMENT-IDENTIFIER: US 20030237016 A1
TITLE: System and apparatus for accelerating content delivery throughout networks

Application Filing Date:
20010301

Summary of Invention Paragraph:
[0007] In the world of the Internet, most service providers are interested in accommodating some number of `hits` per minute. Accommodating some number of `hits` translates generally into forming a corresponding number of TCP/IP connections and downloading at least one file via HTTP or FTP. Where traditional architectures are limited in their ability to handle increasing numbers of TCP/IP connections due to the software overhead involved in handling each session's state information, the service providers must generally calculate the number of `hits` per minute that a single server is capable of handling, and then calculate the number of servers generally required to be running in parallel to handle a projected, aggregate load. Such connection limitations and disadvantages may be experienced in both wireline and wireless content serving.

Summary of Invention Paragraph:
[0009] The majority of the traffic generated from web hosting sites may be characterized as asymmetric, favoring movement from web servers to clients, and involving the transfer of static content. Approximately 70% of HTTP requests for data are for static content. FTP, the primary protocol used for file transfers ranging from MP3 files to software upgrades, is also responsible for transferring large volumes of static content. In addition to file downloads, newer protocols exist which have been designed to download `streams` of static content such as video.

Summary of Invention Paragraph:
[0010] A content delivery solution which does not posses the drawbacks experienced with traditional server farms involves employing a content router which may be used to offload storage reads from a host server's CPU (central processing unit) and I/O sub-system (Input/Output). Such a configuration enables virtually unlimited bandwidth scalability without additional CPU processors. In essence, the content router serves, at least in part, as a uni-directional content transport network appliance that accesses content from storage and routes it to requesting IP (Internet Protocol) addresses over a network. When deployed in conjunction with a conventional server responsible for storage writes, network management, and system administration, the flexibility of the general-purpose computer is maintained while the reliability of a network appliance to access static content is leveraged. Applications that may benefit from such a content router include the aforementioned file downloading, static HTTP content serving and streaming media, as well as web caching and other applications with intensive read operations.

Summary of Invention Paragraph:
[0011] Accordingly, the present invention provides a system for rapidly delivering large volumes of content from storage. The system preferably includes at least one content router having at least one network processor, memory operably coupled to the at least one network processor and at least one routing switch operably coupled

to the network processor. In addition, the content router preferably includes a LAN interface operably coupled to the routing switch that is preferably operable to communicate with a local area network, a WAN interface operably coupled to the routing switch that is preferably operable to communicate with a wide area network and a SAN (storage area network) interface operably coupled to the routing switch that is preferably operable to communicate with a SAN. A program of instructions storable in the memory and executable in the processor is also included and is preferably operable to interrogate packets received through the WAN interface and to instruct the routing switch to switch the packets between the LAN, WAN and SAN interfaces based upon the results of the interrogation. At least one storage device coupled to the SAN interface may also be included in the system.

Summary of Invention Paragraph:
[0018] The present invention further provides technical advantages of autonomous content streaming, infinite up-scaling of download throughput bandwidth and low-overhead system administration that scales logarithmically with throughput bandwidth as well as seamlessly integrating with standard network and system management software packages.

Detail Description Paragraph:
[0130] In the case of a layer 3 or layer 2 switch replacing load balancing web switch 1115, content router 200 preferably handles all load balancing and switching to nodes within the content router 200 cluster, including that traffic which needs to be switched to server 215. In this scenario, there may be a primary content router 200 in the cluster that is operable to load balance TCP/IP connection setups and application layer protocols across the remaining content routers 200 and servers 215 in the cluster.

First Hit

□ Generate Collection

L11: Entry 1 of 11 File: PGPB Jun 6, 2002

DOCUMENT-IDENTIFIER: US 20020069420 A1
TITLE: System and process for delivery of content over a network

Abstract Paragraph:

Network systems and processes for delivery of electronic content to recipient processors may be configured to facilitate the delivery of relatively large content items and/or a relatively large number of content items. In one example, a movie rental system and process delivers (downloads) movie files to customers across the Internet. System network architecture includes three or more layers of servers, including a main server supporting an interface for recipient processors to request content items, a plurality of parent servers, and a plurality of edge servers. Edge servers are distributed throughout a region in which the system provides content delivery services to recipient processors. Parent servers, spaced across the service region, support edge servers. A copy of each content item available through the service is distributed from the main server to each parent servers for storage. Parent servers distribute content to edges servers, pursuant to instructions from the main server or requests from the edge servers. The main server receives and processes requests for content items from recipient processors and directs recipient processors to edge servers for obtaining requested content items. The main server also authenticates licenses and publishes rules for the distribution of content items.

Application Filing Date:
20010406

Summary of Invention Paragraph:
[0002] For example, the Internet is used by a variety of business, organizations, governments and individuals to deliver various types of content to Internet enabled devices, including website content for displaying a website on a user's computer, as well as digitally encoded content files. Some Internet websites provide opportunites to download files containing digitally encoded text (such as papers, forms, patents), pictures, images or computer games. In some websites, larger files, such as video files, video games or music files may be downloaded by a user. As a result, a variety of content delivery services are presently provided over communication networks, such as the Internet.

Summary of Invention Paragraph:
[0003] The speed and efficiency at which network users may download content over a network can be largly dependent upon the size of the content files, the number of users simultaneously using the content delivery service and the speed and efficiency of the servers and other system components used by the content delivery service. As the number of users of a content delivery service increases, the delays experienced by users attempting to download content files can increase, unless the service operator provides sufficiently fast and efficent servers and other system components. However, robust servers and system components are expensive to obtain and operate. Thus, with many Internet sites, users may experience significant delays in downloading content files, especially during higher traffic periods and with sites that deliver large content files.

Summary of Invention Paragraph:

[0004] In addition, the delivery of large files can require a large storage capacity and bandwidth, as compared to smaller files. These factors can render conventional systems impractical for downloading large numbers of large files. Thus, typical conventional systems may be impractical or inefficient for providing large-scale services for delivery of large files, such as movie files, music files, video game files or other large program or data files, to users on a network. Accordingly, there is an industry demand for an efficient manner of providing an on-line service for deliverying large numbers of large files, for example, to many users over a wide region.

Summary of Invention Paragraph:
[0008] One example embodiment relates to a movie rental system and process for delivering (downloading) movie files to customers across the Internet. In that example, the content may comprise at least one electronic, digital copy of a movie. Other embodiments of the invention may involve delivery of other types of content including, but not limited to, music files, still image files, game programs, or other software or data.

Summary of Invention Paragraph:
[0011] The main server system supports a website (or other interface) accessable to users on UNDs over a network, such as the Internet. The website may provide an interface for allowing users to select and request content items for downloading. The website may also provide a means for users to purchase a license to access requested content items.

Summary of Invention Paragraph:
[0012] Downloading every content item directly from the main server may require a very large and complex server (especially where the content items are relatively large and/or the number of content items is large). Accordingly, in some embodiments, the function of downloading content items to users is distributed among the edge servers. When a user purchases a license for a selected content item the main server provides the user's UND with a URL (uniform resource locator) that will allow the user to connect to an edge server to download an encrypted electronic file containing the selected content item. The user may input the URL to the user's web browser immediately or wait and download the content item at a later time. Alternatively, this URL can be provided transparently to the user's web browser to cause the download to begin immediately.

Detail Description Paragraph:
[0022] As described above, embodiments of the invention relate to systems and processes for delivery of electronic content to recipient processors over a network. The term "electronic content" (or "content") is used herein to refer to all forms of electronic information (information that may be communicated and processed in an electronic form), including, but not limited to electronic files, streamed data, or other data formats for movies, video, music or other audio, still images, game programs, application software, electronic books, episodic television content or other the like Embodiments of the invention may be configured to facilitate the delivery of a relatively large number of content files, data streams or other data arrangements (and/or one or more relatively large content file, data stream or other data arrangement) over a network to a plurality of recipient devices (or users). In yet further embodiments, a system and process is configured for providing a content delivery service, for delivering such content to many users located over a relatively wide region. For example, the system and process may be used as a mechanism for a content owner or holder to distribute content to users on a network, such as the Internet. However, many aspects of the invention may be used in other contexts, including, but not limited to industrial, military, scientific, educational or other contexts in which the delivery of a large number of files and/or a number of large files to a plurality of recipient devices on a network is desired.

First Hit Fwd Refs

□ Generate Collection

L11: Entry 5 of 11 File: USPT Mar 12, 2002

DOCUMENT-IDENTIFIER: US 6356947 B1
TITLE: Data delivery system

Application Filing Date (1):
19990219

Brief Summary Text (13):
Above all, a data delivery system as claimed by the invention has advantages when a large number of client nodes are required to have access to a large number of different contents. Such a system is difficult to realize using the solutions of the prior art.

Brief Summary Text (15):
It is thereby advantageous above all that the central server nodes also centrally manage the distribution of the contents to the data server nodes. A further optimization of the data delivery system is thereby possible, and the quality of service of the data delivery system and the resources required by it are further reduced.

Detailed Description Text (28):
The control unit LC controls the downloading of data sets stored in the content server nodes CONST1 and CONST2 into the storage unit VDB. Upon receipt of a control message from the central server node AS, it sends a request message to one of the content server nodes, which requests the content server node to load a data set with a specific content into the data server node SS1. This content is specified by the control message received. The data set is then received via the communication network KN1 and the communication unit INT1', and is then stored by the control unit LC in the storage unit VDB. Because this downloading process takes place via the broad-band data network KN1, the loading process takes only a short time, compared to the playback time of the data set through the playback unit VPU.

Detailed Description Text (32):
The control unit SH controls the dynamic assignment of data server nodes to the requesting client nodes and manages the distribution of the contents to the data server nodes SS1 to SS4. The assignment is dynamic, to the extent that it is a function of the current status of the data delivery system DPS. The management of the distribution of the content via the control unit SH is advantageous, but not mandatory, for the operation of the data delivery system DPS.

Detailed Description Text (38):
Via the status data stored in the storage unit SDC, the control unit SH also manages the distribution of the content via the data server nodes SS1 to SS2. If it does not find any data server nodes that meet the criteria of the first or the second group defined above, the control unit SH selects one or more data server nodes and, by sending a corresponding control message to the selected data server node or nodes, initiates the downloading of the data set with the desired content into the data server node or nodes.

Detailed Description Text (41):
If none of the data server nodes SS1 to SS4 meets the criterion of the third group,

the control unit SH causes the selected data server node, during the downloading of the data set with the requested content, to overwrite a data set stored in the storage unit VDB. In this case, the control unit SH first selects a data set that is to be overwritten, because the content of this data set is not frequently requested by client nodes, in comparison to the number of the copies of this data set stored in the data server nodes SS1 to SS4. Then the data server node is selected in which this selected data set is stored. From this fourth group, analogous to the selection process described above, the data server node is selected in which a data set with the requested content is to be loaded.

Detailed Description Text (46):
Because the specified content has not yet been stored in the data server node SS1, the control unit SH sends a message L(CONT) to the data server node SS1, by means of which it requests the latter to download a data set with the specified content. The control unit LC processes the message L(CONT) and sends a message RL(CONT) to the content server node CONTS1, which then sends the data set with the content specified in the message CONT via the communications network KN2 to the data server node SS1, where the data set is stored in the storage unit VDB. As a result, the status data stored in the storage unit SP are changed. The new status data are then sent by the control unit SP with the message STA(SS1) to the central server node AS, where they are stored by the control unit SC in the control unit SDC.

CLAIMS:

6. A method as claimed in claim 1, further including:

controlling downloading of data sets from one or more content server nodes into the data server nodes by the central server node.

First Hit Fwd Refs

□ Generate Collection

L10: Entry 18 of 36 File: USPT Jun 25, 2002

DOCUMENT-IDENTIFIER: US 6411616 B1
TITLE: High bandwidth broadcast system having localized multicast access to broadcast content

Application Filing Date (1):
20000419

Detailed Description Text (3):
At each interconnection node is a device called a router, designated here as R1-R6. The function of the router is to receive an input packet of information, examine its source and destination address, and determine the optimal output port for the message. These receive, route determinations, and transmit functions are central to all routers.

Detailed Description Text (46):
One advantage of the foregoing system architecture is that it provides a scaleable architecture that may be sealed to deliver a small number of megabits as well as further scaled to deliver nearly a gigabit of content to a large number of host computers. This architecture is only constrained by satellite transponder capacity, which is typically about 30 mbs per transponder.

Detailed Description Text (94):
3. Software Download

Detailed Description Text (95):
The controller unit 440 handles software downloads for itself and for all of the transponder units 445. Software downloads are preferably performed using FTP file downloads over the local ISP LAN the 240 through NIC 467, from a remote station over the modem interface 470, or through the RS-232 port 487. Before a file is downloaded, FTP server software in the controller unit 440 verifies that the download is, in fact, a new file. The files are preferably downloaded into a fixed directory structure.

Detailed Description Text (97):
The NOC 472 maintains a series of tables used to configure a network of systems such as the one shown in FIG. 15, each system being linked to the NOC 472. These tables may be downloaded using FTP or a predetermined table download command and are used by the controller unit 440 to configure all of the transponder units 445 and to handle any data rate adaptation required by the system. The tables include a Channel Definition Table (CDT), a Carrier Table (CT), and a Channel Cluster Table (CC).

Detailed Description Text (125):
The controlling unit software supports multiple forms of self-diagnostics. Some of the diagnostics run on power up to verify system integrity, and other diagnostic functions are run periodically while the controller unit 440 is operational. For example, the controller unit 440 initially runs several diagnostics including a memory test, a virus scan, a File Allocation Table (FAT) check, a backplane LAN 532 connectivity test, and an external 100 based-T LAN 240 interface test when power is first supplied. As part of its ongoing monitoring process, the controller unit 440

also performs hard drive 455 integrity tests to verify that the file system has not been corrupted. If a hard drive error is encountered, the controller unit 440 logs the error into its trace history, and tries to correct the problem via downloading any corrupted files from the Network Operation Center 472. Still further, the controller unit 440 monitors the fault status of every transponder unit 445 with which it is associated in the respective IPMS 120. The fault monitoring status is an on-going periodic process. All faults are preferably entered into a trace buffer that is available for history tracking. Each fault will be time-stamped and stored in non-volatile memory.

Detailed Description Text (134):
3. Table Download

Detailed Description Text (135):
The network provisioning tables are downloaded via a table download facility. This command is used to process all new tables and reconfigures the system as necessary. The tables are described above.

First Hit

□ Generate Collection

L10: Entry 3 of 36 File: PGPB Aug 29, 2002

DOCUMENT-IDENTIFIER: US 20020118638 A1
TITLE: High bandwidth broadcast system having localized multicast access to broadcast content

Application Filing Date:
20010131

Detail Description Paragraph:
[0079] At each interconnection node is a device called a router, designated here as R1-R6. The function of the router is to receive an input packet of information, examine its source and destination address, and determine the optimal output port for the message. These receive, route determinations, and transmit functions are central to all routers.

Detail Description Paragraph:
[0122] One advantage of the foregoing system architecture is that it provides a scaleable architecture that may be scaled to deliver a small number of megabits as well as further scaled to deliver nearly a gigabit of content to a large number of host computers. This architecture is only constrained by satellite transponder capacity, which is typically about 30 mbs per transponder.

Detail Description Paragraph:
[0171] 3. Software Download

Detail Description Paragraph:
[0172] The controller unit 440 handles software downloads for itself and for all of the transponder units 445: Software downloads are preferably performed using FTP file downloads over the local ISP LAN the 240 through NIC 467, from a remote station over the modem interface 470, or through the RS-232 port 487. Before a file is downloaded, FTP server software in the controller unit 440 verifies that the download is, in fact, a new file. The files are preferably downloaded into a fixed directory structure.

Detail Description Paragraph:
[0174] The NOC 472 maintains a series of tables used to configure a network of systems such as the one shown in FIG. 15, each system being linked to the NOC 472. These tables may be downloaded using FTP or a predetermined table download command and are used by the controller unit 440 to configure all of the transponder units 445 and to handle any data rate adaptation required by the system. The tables include a Channel Definition Table (CDT), a Carrier Table (CT), and a Channel Cluster Table (CC).

Detail Description Paragraph:
[0214] The controlling unit software supports multiple forms of self-diagnostics. Some of the diagnostics run on power up to verify system integrity, and other diagnostic functions are run periodically while the controller unit 440 is operational. For example, the controller unit 440 initially runs several diagnostics including a memory test, a virus scan, a File Allocation Table (FAT) check, a backplane LAN 532 connectivity test, and an external 100 based-T LAN 240 interface test when power is first supplied. As part of its ongoing monitoring